

BEST AVAILABLE COPY
PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-358202

(43)Date of publication of application : 26.12.2001

(51)Int.Cl.

H01L 21/68

C23C 14/50

G02F 1/13

(21)Application number : 2000-178434

(71)Applicant : MITSUBISHI-ELECTRIC CORP

(22)Date of filing : 14.06.2000

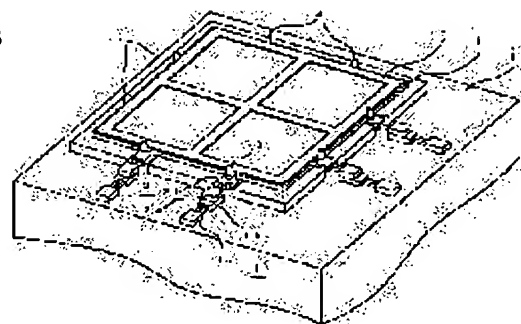
(72)Inventor : IWATA SHIYOUTAROU
OKADA MAKOTO

(54) ALIGNMENT DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an alignment device capable of accurately positioning a metal mask without lifting the mask.

SOLUTION: A lifting cylinder having a weak pressing force is provided at a conventional cylinder for pressing the metal mask, and the mask is pressed to a fixed pin side by a movable pin provided at a movable end of the lifting cylinder and positioned.



LEGAL STATUS

[Date of request for examination] 22.05.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the
examiner's decision of rejection or application
converted registration]

[Date of final disposal for application]

[Patent number] 3702754

[Date of registration] 29.07.2005

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] In the alignment equipment which carries out positioning wearing of a glass substrate and the metal mask The mask plate which is arranged on a positioning base and lays a metal mask, The lock-pin which is arranged on the above-mentioned positioning base and positions one end face of the above-mentioned metal mask to a position, While having movable pressing force on the above-mentioned mask plate, the movable pin and the above-mentioned metal mask for pushing the above-mentioned metal mask against the above-mentioned lock-pin side While having bigger pressing force than the floating cylinder which equips the movable end with the above-mentioned movable pin, and the above-mentioned floating cylinder The cylinder with ** which is arranged on the above-mentioned positioning base and equips the movable end with the above-mentioned floating cylinder, The above-mentioned movable pin is pressed against the end face of the above-mentioned metal mask by actuation of a preparation, the above-mentioned floating cylinder, and a cylinder with *****. Alignment equipment characterized by constituting so that it may be made to move-until the above-mentioned metal mask touches the above-mentioned lock-pin, and the above-mentioned metal mask may be positioned to the above-mentioned lock-pin.

[Claim 2] Alignment equipment according to claim 1 characterized by forming in a concave convex the front face of a mask plate in which a metal mask is laid.

[Claim 3] Alignment equipment according to claim 1 characterized by having the magnet holder which wore the MAG, the robot hand which conveys the above-mentioned magnet holder, and the robot hand which conveys a glass substrate, making a metal mask and the above-mentioned magnet holder adsorb with the MAG on both sides of the above-mentioned glass substrate, and positioning the above-mentioned metal mask to the above-mentioned glass substrate.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the alignment equipment for positioning a substrate and a metal mask with a sufficient precision in liquid crystal substrate manufacture conveyance Rhine.

[0002]

[Description of the Prior Art] In liquid crystal substrate manufacture conveyance Rhine, when feeding a glass substrate into processors, such as a sputtering system, after piling up a glass substrate and a metal mask with a sufficient precision, it is necessary to convey. The configuration of a metal mask is extracted with the size and the number of ** sheets of one glass substrate, the pattern is decided, and the thing of the shape of a character of a rice field or the shape of a character of an eye is prepared. Generally as the quality of the material, 42 alloys (42%nickel-Fe alloy) and the thing of 0.25mm of board thickness are used. There are some which are shown in drawing 5 as conventional alignment equipment which positions a metal mask. Moreover, as a robot hand which deals with a glass substrate and a metal mask, there are some which are shown in drawing 6 and drawing 7. In drawing, it is the mask plate with which 5 is arranged at the metal mask of the shape of a character of a rice field, and 11 is arranged on the positioning base 12. 22 is the cylinder prepared in two places of the direction of a vertical angle of the metal mask 5, 22a is the fixed end and 22b is the movable end. Fixed-end 22a is fixed to the positioning base 12, and two gage pins 23 are fixed to movable-end 22b. 30 is a robot hand and consists of components of 31 to 34 explained below. 31 is fixed with the tip of the robot arm which is not illustrated by the robot flange. 32 is a hand body. 33 is a holder adsorption pad and is constituted possible [vertical movement] to the hand body 32. 34 is a glass adsorption pad and is fixed to the hand body 32. 35 is a magnet holder, consists of a tabular member which wore the MAG, and is dealt with with the holder adsorption pad 33. 36 is a glass substrate, is adsorbed by the glass adsorption pad 34 and conveyed.

[0003] The case where the metal mask 5 is positioned in such conventional alignment equipment is explained. What unified the metal mask 5, the glass substrate 36, and the magnet holder 35 with the robot is located on the mask plate 11, as shown in drawing 6. Next, if the holder adsorption pad 33 is moved up, the magnet holder 35 separates from a glass substrate 36, and thereby, the metal mask 5 with which the glass substrate 36 was equipped by magnetism will separate from a glass substrate 36, and will be laid on the mask plate 11. Next, a cylinder 22 is forced to the location which puts two gage pins 23 fixed to the movable-end 22b with the corner of the metal mask 5, and is stopped at the stroke end of 2 sets of cylinders 22 on the vertical angle of the metal mask 5. After positioning of the metal mask 5 retreats a locator pin 23, and lays a glass substrate 36 on the metal mask 5 by the robot hand 30. In addition, the metal mask 5 and a glass substrate 36 can be piled up with a sufficient precision by performing positioning with the robot hand 30 of a glass substrate 36 like JP,10-329064,A on another stage. If the magnet holder 35 which stuck to the holder adsorption pad 33 is turned to a glass substrate 36 and after superposition drops it to it, it will be adsorbed in the metal mask 5 on both sides of a glass substrate 36 by the magnetism. Thereby, the metal mask 5, the magnet holder 35, and a glass substrate 36 are unified, and it is conveyed by the processor with a robot etc.

[0004]

[Problem(s) to be Solved by the Invention] With the above conventional alignment equipments, since the metal mask 5 is pushed to the stroke end of a cylinder 22 on the vertical angle, if the dimension of the metal mask 5 is large, in order that the metal mask 5 may bend and come floating and may carry a glass substrate 36, when retreating a gage pin 23, the phenomenon in which the location of the metal mask 5 shifts occurs. Moreover, it will push, if the dimension of the metal mask 5 is small, lack occurs, and only one gage pin 23 contacts and is positioned. For this reason, there was a trouble that exact positioning could not be performed between the metal mask 5 and the glass substrate 36 to lay.

[0005] This invention aims at obtaining the alignment equipment which can position correctly, without having been

made in order to solve this trouble, and floating a metal mask.

[0006] Furthermore, adhesion with a metal mask and a mask plate is prevented, the positioning force of a metal mask is stabilized, and it aims at making it position correctly.

[0007]

[Means for Solving the Problem] In the alignment equipment concerning this invention, the floating cylinder which gave the movable pin is prepared in the cylinder which pushes the conventional metal mask, and a metal mask is pushed against it by the movable pin of a floating cylinder at a lock-pin side.

[0008] Furthermore, the front face of a mask plate in which a metal mask is laid is formed in concave convexes, such as shot-blasting processing.

[0009]

[Embodiment of the Invention] The perspective view and drawing 2 R> 2 which show the alignment equipment whose gestalt 1. drawing 1 of operation is the gestalt 1 of implementation of this invention are [that pneumatics circuit diagram and drawing 4 of the principle-of-operation Fig. of alignment equipment and drawing 3] partial detail drawing. In addition, since the configuration of a robot hand is the same as that of drawing 6 and drawing 7 , the explanation is omitted. In drawing, 1 is a cylinder with **, it is for pushing the metal mask 5 on the mask plate 11 at one side, and 2 sets and a total of 4 sets are arranged on the positioning base 12 to two sides of the metal mask 5, respectively. As a cylinder 1 with **, the thing whose stroke is about 50-100mm and whose pressing force is about several kg is used. 2 is a floating cylinder and is fixed to movable-end 1b of the cylinder 1 with **, respectively. As a floating cylinder 2, the thing of extent to which a stroke can move by about 5-20mm, and pressing force can move the metal mask 5 on the mask plate 11 is used. 3 is fixed to movable-end 2b of the floating cylinder 2 by the forcing pin. 4 is a lock-pin for positioning, as compared with the cylinder 1 with **, or the floating cylinder 2, the cylinder (not shown) of pressing force big enough is used, and at the time of installation of a glass substrate, it is constituted so that it may become the location in which it does not retreat and interfere. 6a-6d are speed controllers which adjust control and passing speed of advance and retreat of movable-end 1b of each cylinder 1 with **. 7a-7d are the piping path. 6e-6l., it is the speed controller which adjusts control and passing speed of advance and retreat of movable-end 2b of each floating cylinder 2, and it is divided into the group of 6e, 6g, 6i, and 6k, and a group (6f, 6h, 6j, and 6l.), and the optimal passing speed doubled with the form of the metal mask 5 for every group is set up. 8a-8d are form change bulbs, and the passing speed doubled with the form of the metal mask 5 can change it with the change signal 10. 9a-9d are the piping paths to each floating cylinder 2. Shot-blasting processing is performed and the concave convex is formed so that it can move easily on the top face of the mask plate 11, without the metal mask 5 sticking by the pressing force of the floating cylinder 2. [0010] Thus, in the constituted alignment equipment, the case where a glass substrate 36 is positioned and put with the metal mask 5 and the magnet holder 35 is explained. In addition, a glass substrate 36 and the metal mask 5 are in the condition that positioning accuracy is bad, and are explained as what is unified by the magnetism of the magnet holder 35 as shown in drawing 6 . After the lock-pin 4 first prepared in the positioning base 12 moves to the positioning location of normal, the metal mask 5 unified by the robot hand 30, a glass substrate 36, and the magnet holder 35 are moved above the mask plate 11. Next, if the holder adsorption pad 33 which adsorbed the magnet holder 35 is moved up, in order to separate from the magnet holder 35, the magnetism to the metal mask 5 will decline, and the metal mask 5 will separate from a glass substrate 36, and will be laid on the mask plate 11. Next, movable-end 1b of each cylinder 1 with ** and the floating cylinder 2 and 2b are advanced with a speed controllers [of a pneumatics circuit / 6a-6d] advance control signal (not shown), and the advance control signal (not shown) to the speed controllers 6e, 6g, 6i, and 6k by the form change bulbs [8a-8d] change signal 11. The metal mask 5 is pushed against a lock-pin 4 side by the movable pin 3 prepared in movable-end 2b of the floating cylinder 2. it can be considered that a lock-pin 4 is what was fixed to the positioning base 12 by the cylinder (not shown) of pressing force big enough for the forcing ***** reason. Since the thing of the pressing force of extent with the metal mask 5 movable on the mask plate 11 is used for the floating cylinder 2, when an overload is applied to the metal mask 5, movable-end 2b in which the movable pin 3 was formed retreats. For this reason, the metal mask 5 bends, and it does not come floating, or the lack of forcing does not occur. Moreover, even if positioning of the direction of X is completed previously, for example, pressing force of the movable pin 3 and positioning of the direction [in other words] of Y according to the movable pin 3 since the pressing force of the floating cylinder 2 is small can also be performed easily later. In addition, if retreating the movable pin 3 after positioning of the direction of X, and making the direction of Y position etc. next controls each floating cylinder 2 to repeat positioning and retreat by turns in the XY direction, it is also possible to perform more exact positioning. After [of the metal mask 5] in position retreats a lock-pin 4 and the movable pin 2, moves the glass adsorption pad 34 caudad, and lays a glass substrate 35 on the metal mask 5. Next, if the holder adsorption pad 33 is moved caudad and the magnet holder 35 is carried on a glass substrate 36, the metal mask 5 will be unified by the magnetism of the magnet

holder 35 with a glass substrate 36 and the magnet holder 35. It is conveyed by the processor with a robot etc. after that.

[0011]

[Effect of the Invention] Since this invention is constituted as explained above, it does so the effectiveness which does not float a metal mask and can carry out positioning wearing of the metal mask correctly to a glass substrate.

[0012] Moreover, since the front face of a mask plate in which a metal mask is laid was made into the concave convex, a metal mask does not stick with a mask plate, but the stable pressing force is obtained, and the metal mask itself can be positioned correctly.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the alignment equipment for positioning a substrate and a metal mask with a sufficient precision in liquid crystal substrate manufacture conveyance Rhine. - - - - -

[Translation done.]

*** NOTICES ***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] In liquid crystal substrate manufacture conveyance Rhine, when feeding a glass substrate into processors, such as a sputtering system, after piling up a glass substrate and a metal mask with a sufficient precision, it is necessary to convey. The configuration of a metal mask is extracted with the size and the number of ** sheets of one glass substrate, the pattern is decided, and the thing of the shape of a character of a rice field or the shape of a character of an eye is prepared. Generally as the quality of the material, 42 alloys (42%nickel-Fe alloy) and the thing of 0.25mm of board thickness are used. There are some which are shown in drawing 5 as conventional alignment equipment which positions a metal mask. Moreover, as a robot hand which deals with a glass substrate and a metal mask, there are some which are shown in drawing 6 and drawing 7 . In drawing, it is the mask plate with which 5 is arranged at the metal mask of the shape of a character of a rice field, and 11 is arranged on the positioning base 12. 22 is the cylinder prepared in two places of the direction of a vertical angle of the metal mask 5, 22a is the fixed end and 22b is the movable end. Fixed-end 22a is fixed to the positioning base 12, and two gage pins 23 are fixed to movable-end 22b. 30 is a robot hand and consists of components of 31 to 34 explained below. 31 is fixed with the tip of the robot arm which is not illustrated by the robot flange. 32 is a hand body. 33 is a holder adsorption pad and is constituted possible [vertical movement] to the hand body 32. 34 is a glass adsorption pad and is fixed to the hand body 32. 35 is a magnet holder, consists of a tabular member which wore the MAG, and is dealt with with the holder adsorption pad 33. 36 is a glass substrate, is adsorbed by the glass adsorption pad 34 and conveyed.

[0003] The case where the metal mask 5 is positioned in such conventional alignment equipment is explained. What unified the metal mask 5, the glass substrate 36, and the magnet holder 35 with the robot is located on the mask plate 11, as shown in drawing 6 . Next, if the holder adsorption pad 33 is moved up, the magnet holder 35 separates from a glass substrate 36, and thereby, the metal mask 5 with which the glass substrate 36 was equipped by magnetism will separate from a glass substrate 36, and will be laid on the mask plate 11. Next, a cylinder 22 is forced to the location which puts two gage pins 23 fixed to the movable-end 22b with the corner of the metal mask 5, and is stopped at the stroke end of 2 sets of cylinders 22 on the vertical angle of the metal mask 5. After positioning of the metal mask 5 retreats a locator pin 23, and lays a glass substrate 36 on the metal mask 5 by the robot hand 30. In addition, the metal mask 5 and a glass substrate 36 can be piled up with a sufficient precision by performing positioning with the robot hand 30 of a glass substrate 36 like JP,10-329064,A on another stage. If the magnet holder 35 which stuck to the holder adsorption pad 33 is turned to a glass substrate 36 and after superposition drops it to it, it will be adsorbed in the metal mask 5 on both sides of a glass substrate 36 by the magnetism. Thereby, the metal mask 5, the magnet holder 35, and a glass substrate 36 are unified, and it is conveyed by the processor with a robot etc.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention is constituted as explained above, it does so the effectiveness which does not float a metal mask and can carry out positioning wearing of the metal mask correctly to a glass substrate.

[0012] Moreover, since the front face of a mask plate in which a metal mask is laid was made into the concave convex, a metal mask does not stick with a mask plate, but the stable pressing force is obtained, and the metal mask itself can be positioned correctly.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] With the above conventional alignment equipments, since the metal mask 5 is pushed to the stroke end of a cylinder 22 on the vertical angle, if the dimension of the metal mask 5 is large, in order that the metal mask 5 may bend and come floating and may carry a glass substrate 36, when retreating a gage pin 23, the phenomenon in which the location of the metal mask 5 shifts occurs. Moreover, it will push, if the dimension of the metal mask 5 is small, lack occurs, and only one gage pin 23 contacts and is positioned. For this reason, there was a trouble that exact positioning could not be performed between the metal mask 5 and the glass substrate 36 to lay.

[0005] This invention aims at obtaining the alignment equipment which can position correctly, without having been made in order to solve this trouble, and floating a metal mask.

[0006] Furthermore, adhesion with a metal mask and a mask plate is prevented, the positioning force of a metal mask is stabilized, and it aims at making it position correctly.

[Translation done.]

*** NOTICES ***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] In the alignment equipment concerning this invention, the floating cylinder which gave the movable pin is prepared in the cylinder which pushes the conventional metal mask, and a metal mask is pushed against it by the movable pin of a floating cylinder at a lock-pin side.

[0008] Furthermore, the front face of a mask plate in which a metal mask is laid is formed in concave convexes, such as shot-blasting processing.

[0009]

[Embodiment of the Invention] The perspective view and drawing 2 R> 2 which show the alignment equipment whose gestalt 1. drawing 1 of operation is the gestalt 1 of implementation of this invention are [that pneumatics circuit diagram and drawing 4 of the principle-of-operation Fig. of alignment equipment and drawing 3] partial detail drawing. In addition, since the configuration of a robot hand is the same as that of drawing 6 and drawing 7, the explanation is omitted. In drawing, 1 is a cylinder with **, it is for pushing the metal mask 5 on the mask plate 11 at one side, and 2 sets and a total of 4 sets are arranged on the positioning base 12 to two sides of the metal mask 5, respectively. As a cylinder 1 with **, the thing whose stroke is about 50-100mm and whose pressing force is about several kg is used. 2 is a floating cylinder and is fixed to movable-end 1b of the cylinder 1 with **, respectively. As a floating cylinder 2, the thing of extent to which a stroke can move by about 5-20mm, and pressing force can move the metal mask 5 on the mask plate 11 is used. 3 is fixed to movable-end 2b of the floating cylinder 2 by the forcing pin. 4 is a lock-pin for positioning, as compared with the cylinder 1 with **, or the floating cylinder 2, the cylinder (not shown) of pressing force big enough is used, and at the time of installation of a glass substrate, it is constituted so that it may become the location in which it does not retreat and interfere. 6a-6d are speed controllers which adjust control and passing speed of advance and retreat of movable-end 1b of each cylinder 1 with **. 7a-7d are the piping path. 6e-6l, it is the speed controller which adjusts control and passing speed of advance and retreat of movable-end 2b of each floating cylinder 2, and it is divided into the group of 6e, 6g, 6i, and 6k, and a group (6f, 6h, 6j, and 6l.), and the optimal passing speed doubled with the form of the metal mask 5 for every group is set up. 8a-8d are form change bulbs, and the passing speed doubled with the form of the metal mask 5 can change it with the change signal 10. 9a-9d are the piping paths to each floating cylinder 2. Shot-blasting processing is performed and the concave convex is formed so that it can move easily on the top face of the mask plate 11, without the metal mask 5 sticking by the pressing force of the floating cylinder 2. [0010] Thus, in the constituted alignment equipment, the case where a glass substrate 36 is positioned and put with the metal mask 5 and the magnet holder 35 is explained. In addition, a glass substrate 36 and the metal mask 5 are in the condition that positioning accuracy is bad, and are explained as what is unified by the magnetism of the magnet holder 35 as shown in drawing 6. After the lock-pin 4 first prepared in the positioning base 12 moves to the positioning location of normal, the metal mask 5 unified by the robot hand 30, a glass substrate 36, and the magnet holder 35 are moved above the mask plate 11. Next, if the holder adsorption pad 33 which adsorbed the magnet holder 35 is moved up, in order to separate from the magnet holder 35, the magnetism to the metal mask 5 will decline, and the metal mask 5 will separate from a glass substrate 36, and will be laid on the mask plate 11. Next, movable-end 1b of each cylinder 1 with ** and the floating cylinder 2 and 2b are advanced with a speed controllers [of a pneumatics circuit / 6a-6d] advance control signal (not shown), and the advance control signal (not shown) to the speed controllers 6e, 6g, 6i, and 6k by the form change bulbs [8a-8d] change signal 11. The metal mask 5 is pushed against a lock-pin 4 side by the movable pin 3 prepared in movable-end 2b of the floating cylinder 2. it can be considered that a lock-pin 4 is what was fixed to the positioning base 12 by the cylinder (not shown) of pressing force big enough for the forcing ***** reason. Since the thing of the pressing force of extent with the metal mask 5 movable on the mask plate 11 is used for the floating cylinder 2, when an overload is applied to the metal mask 5, movable-end 2b in which the movable pin 3 was formed retreats. For this reason, the metal mask 5 bends, and it does not come floating, or the lack of forcing does not

occur. Moreover, even if positioning of the direction of X is completed previously, for example, pressing force of the movable pin 3 and positioning of the direction [in other words] of Y according to the movable pin 3 since the pressing force of the floating cylinder 2 is small can also be performed easily later. In addition, if retreating the movable pin 3 after positioning of the direction of X, and making the direction of Y position etc. next controls each floating cylinder 2 to repeat positioning and retreat by turns in the XY direction, it is also possible to perform more exact positioning. After [of the metal mask 5] in position retreats a lock-pin 4 and the movable pin 2, moves the glass adsorption pad 34 caudad, and lays a glass substrate 35 on the metal mask 5. Next, if the holder adsorption pad 33 is moved caudad and the magnet holder 35 is carried on a glass substrate 36, the metal mask 5 will be unified by the magnetism of the magnet holder 35 with a glass substrate 36 and the magnet holder 35. It is conveyed by the processor with a robot etc. after that.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view of the alignment equipment in which the gestalt 1 of implementation of this invention is shown.

[Drawing 2] It is the principle Fig. of the alignment equipment in which the gestalt 1 of implementation of this invention is shown.

[Drawing 3] It is the pneumatics circuit diagram of the gestalt 1 of implementation of this invention.

[Drawing 4] It is the partial detail drawing of the gestalt 1 of implementation of this invention.

[Drawing 5] It is the perspective view showing conventional alignment equipment.

[Drawing 6] It is a front view at the time of glass substrate wearing by the robot hand.

[Drawing 7] It is a front view at the time of the metal mask separation by the robot hand.

[Description of Notations]

1 Cylinder with **, 2 Floating Cylinder, 3 Movable Pin, 4 Lock-pin, 5 Metal Mask, 11 Mask Plate, 12 Positioning Base, 30 Robot Hand, 35 Magnet Holder, 36 Glass Substrate

[Translation done.]

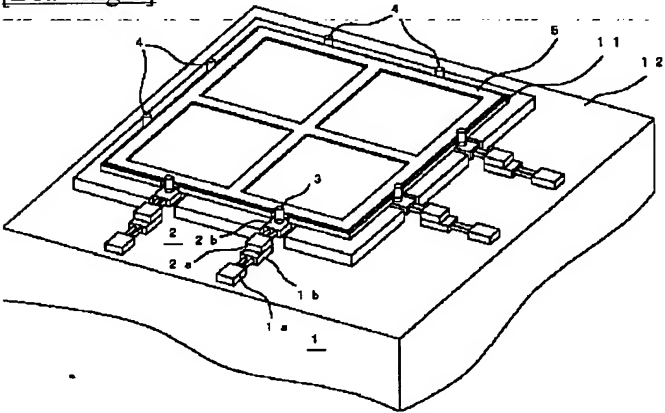
* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

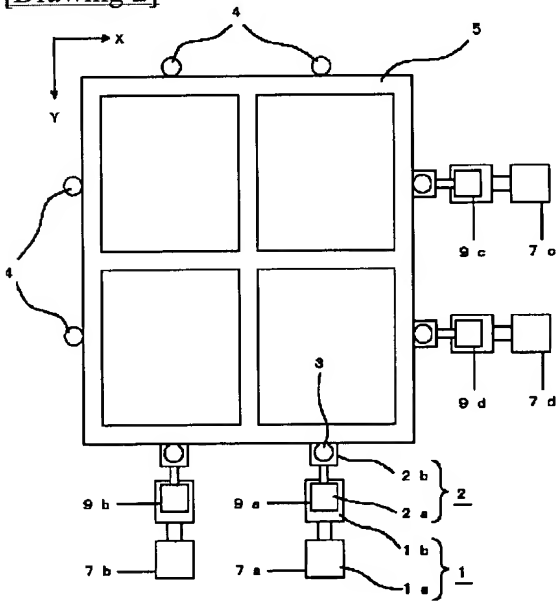
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DRAWINGS

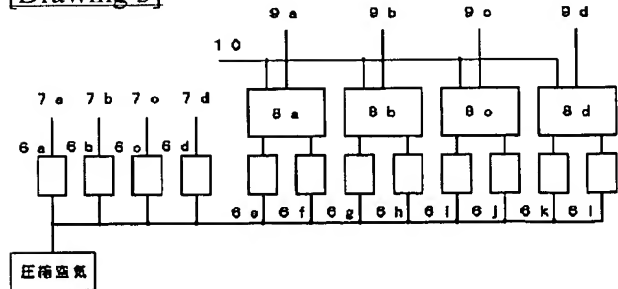
[Drawing 1]



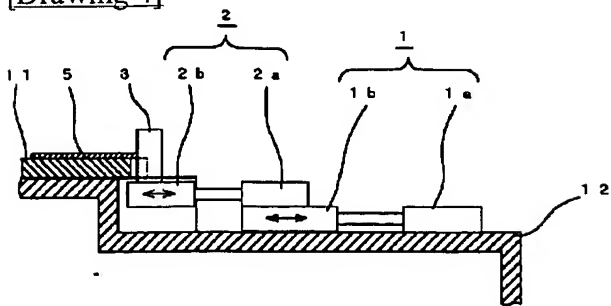
[Drawing 2]



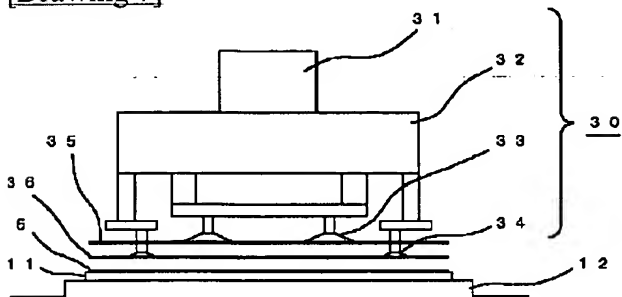
[Drawing 3]



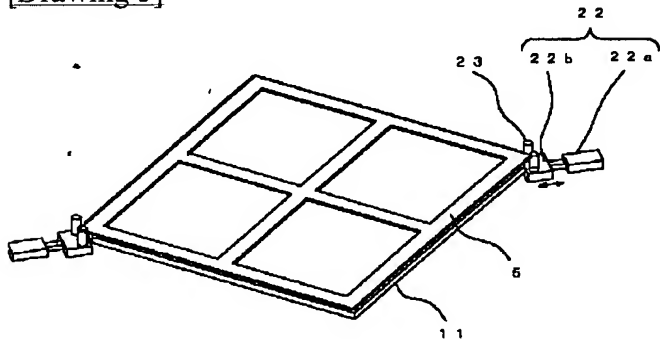
[Drawing 4]



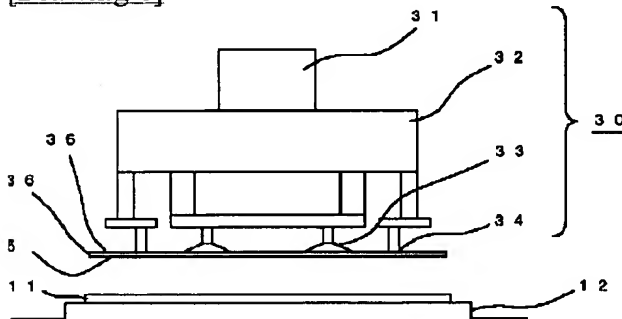
[Drawing 7]



[Drawing 5]



[Drawing 6]



[Translation done.]